A Numerical Model to Analyze Handoff Delay and Packet Loss in PNEMO Environment

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***Abstract*—Wireless networks consist of Mobile Nodes (MNs) which use wireless links to communicate. Usually, they work together to attain a common objective such as environmental monitoring, communication, etc. By nature, the communication among these MNs are not stable as the quality of the wireless links is changed severely. Moreover, the wireless nodes are usually small and therefore resource-constrained. Thus, it is not possible to use algorithms having large processing power or memory footprint. All these factors make the design of mobility management schemes for wireless networks quite a challenge. As a result, it is necessary to test schemes systematically to assess the performance in the expected application scenario. To do so, numerical analysis is a notable process to comprehend the performance of mobility management schemes and the limitation of developing mobility management solutions explicitly for multi-interfaced MR in NEMO networks. This paper proposed a numerical model to analyze handoff performance of Multihoming-based scheme to support Mobility management in Proxy NEMO (MM-PNEMO) environment. After that, it represents a comparative analysis among the standard Network Mobility Basic Support Protocol (NEMO BSP), Proxy NEMO (PNEMO) and MM-PNEMO scheme. The performance metrics estimated for these schemes are mainly handoff delay and packet loss. It has been perceived that, the MM-PNEMO scheme performs better compared to the standard NEMO BSP and PNEMO scheme.**

***Keywords*— MM-PNEMO, NEMO BSP, PNEMO, multi-interfaced MR, mobility management.**

I. Introduction

With the rapid expansion of wireless access network, supproting seamless inter technology handoff is becoming one of the utmost significant concern in order to provide Quality of Service (QoS) for time sensitive applications (i.e. VoIP, Video) in mobile networks [1], [7-9]. QoS can be specified as handoff delay, packet loss, packet delivery ratio, and throughput. Investigation of these performance metrics is particularly fruitful to evaluate each mobility entities performance in mobile networks [2-4].

In mobile wireless networks, mobility models are significant building blocks for numerical-based analysis. It has a substantial impact on the performance evaluation of the mobility management schemes in NEMO [15]. In order to determine the movement rate of Mobile Router (MR) or Mobile Node (MN), it is essential to select an accurate mobility model. The most familiar mobility models utilized in mobile networks nemely Random Waypoint Mobility (RWM) model, City Section Mobility (CSM) model, Manhattan Mobility (MM) model as well as Fluid-flow Mobility (FM) model [13-15].

The basis of this work is to know the functioning mechanism of the mobility management schemes and to determine which protocol provide better handoff performance. The contribution of this paper includes: (i) constructing a numerical model to compare the applicability and efficiency of the MM-PNEMO scheme with that of the standard NEMO-BSP and PNEMO respectively. (ii) Investigate and analyze the handoff performance in terms of handoff latency and packet loss.

The remaining part of this paper is organized as follows: Section 2 provides a brief overview on MM-PNEMO scheme. The proposed numerical model is detailed in Section 3. Then section 4 present numerical outcomes and analysis. Finally, the paper is concluded in section 5.

II. Overview on MM-PNEMO

The MM-PNEMO scheme as shown in Figure 1 offers the location update procedure in order to separate the new attachment of the serving MR (SMR) which is termed as 'fast registration' process from the particular flow movement which is entitled as 'flow-based routing' process [6]. As soon as the New Flow-enabled MR (NFMR) identifies the new attachment of SMR on the target network, the NFMR sends Early Proxy Binding Update (EPBU) message via Handover Initiations (HI) message to the FLMA for initiating the fast registration process without enable flow-based routing information. During fast registration mechanism, the Flow-based Local Mobility Anchor Point (FLMA) accomplishes few tasks for the new attachment such as allocating a new Home Network Prefix (HNP) and Mobile Network Prefix (MNP) of the Physical Interface 2 (PI 2), building new Binding Catch Entry (BCE) for the SMR as well as creating a new tunnel among the FNMR and the FLMA. If the NFMR identifies that the SMR is connected to the new PI (i.e. PI 2), it transmits PBU message containing FMNP option to FLMA in order to initiate flow-based routing process. Once the process is completed successfully, a PBA message is directed from the FLMA to the NFMR. However, if the network entity (i.e. CFMR, NFMR or FLMA) is not informed about the HI message with